

U.S. Patent Application Serial No. 09/180,432
Amendment dated May 17, 2004
Reply to OA of February 27, 2004

REMARKS

Claims 1-9, 11-12, 15-43 and 55-57, are pending in this application.

In the Board of Appeal's decision mailed on December 31, 2003, the Board affirms the Examiner's rejections of claims 1-10 and 15-42. The Board stated that claims 1 and 10 alone, were considered as representative of the rejected claims. Claims 11, 12 and 43 were indicated as allowed by the Examiner in the Examiner's Answer.

Claim 1 has been amended to limit the average diameter of the carbon fiber to not less than 0.5 μm but less than 1.3 μm . Support for this amendment is found throughout the specification and claims as originally filed.

Claim 10 has been canceled without prejudice or disclaimer and has been rewritten as new claims 55-57. New claim 55 differs from claim 10 in that claim 55 recites an average fiber diameter of from 0.5 μm to 5.0 μm . New claim 56 is limited to a carbonizing temperature of not lower than 650°C but lower than 750°C and recites an average fiber diameter of less than 2 μm . New claim 57 differs from claim 10 in that claim 57 is limited to a carbon fiber having an average diameter of not less than 0.5 μm but less than 1.3 μm . Claim 42 has been amended to be dependent on claim 55 or claim 57.

Support for new claims 55-57 appears throughout the specification and claims as originally filed. No new matter has been added.

The Examiner is thanked for indicating claims 11, 12 and 43, allowed.

In view of the amendments to the claims, the new claims, and the remarks set forth below, further and favorable consideration is respectfully requested.

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II. At page 3 of the Decision, the Board indicates claims 1-10 and 15-42 stand rejected under 35 USC §103 (a) as unpatentable over McCullough '716 in view of Otani '455.

A. The Board's Decision dated August 18, 2003: The Board states that it agrees with the Examiner's conclusion that it would have been obvious to the skilled artisan to have used the fibers as taught by Otani as the carbon fibers in the composite of McCullough, in order to form a fire resistant panel with increased strength and modulus.

The Board rejects Appellants' arguments that McCullough argues against using fibers less than 2 microns in diameter because McCullough teaches a range of 2 to 25 microns, preferably 4 to 12 microns, while the claimed range is less than 2 microns. The Board states at page 4 of the Decision, that Otani was applied for teaching the superior properties of anisotropic pitch-based carbon fibers as well as how to prepare such fibers.

B. The Examiner's Answer dated December 17, 2002: On page 4 of the Examiner's Answer, the Examiner states that "Otani...teach carbonaceous pitch and the process for the preparation thereof. The carbonizing of the infusible fiber occurs at a temperature of 100-1300°C (col. 6, ln 63-68)."

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C. Analysis:

(i) The Claims:

Claim 1 has been amended to limit the carbon fiber diameter to not less than 0.5 μm but less than 1.3 μm . Support for this amendment appears throughout the specification and claims as originally filed. Claims 2-9 and 15-41, are either directly or indirectly dependent on claim 1.

Claim 10 has been canceled without prejudice or disclaimer and has been rewritten as new claims 55-57.

Claim 55 recites an average fiber diameter of from 0.5 μm to 5.0 μm and a carbonizing temperature of not lower than 550°C but lower than 800°C.. New claim 56 is limited to a carbonizing temperature of not lower than 650°C but lower than 750°C and recites an average fiber diameter of less than 2 μm . New claim 57 differs from claim 10 in that claim 57 is limited to a carbon fiber having an average diameter of not less than 0.5 μm but less than 1.3 μm , and recites a carbonizing temperature of not lower than 550°C but lower than 800°C.

(ii) Otani:

Regarding the Examiner's position that Otani teaches that carbonizing occurs at a temperature of 100-1300°C, Applicant's note that Otani *does not* teach that carbonizing of the infusible fiber occurs at a temperature of 100-1300°C, at col. 6, lines 63-68. Rather, Otani teaches at col. 6, lines 63-68, that:

"...heat-treating the infusible fiber *over about 800 °C* in an inert atmosphere. The heat treatment suitably includes heating the infusible fiber *at a temperature of 100°C - 1300°C*, preferably gradually increasing the temperature at a rate of 5°C - 100°C/min., preferably 20°C - 50°C/min., in an inert atmosphere, thereby carbonizing the fiber..." (emphasis added)

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This passage *does not* state that carbonizing occurs at a temperature of 100-1300°C. The passage clearly states that the fiber are heated "*at*" a temperature in the noted temperature range, not *to* a temperature in the noted range. Otani clearly requires temperatures over 800°C in order to carbonize the infusible fiber. This passage conveys that heating is started at a temperature within the range and the temperature is then increased until a temperature over 800°C is reached.

The subject passage of Otani begins at the paragraph at line 55, of col. 6. Lines 55-63 of Otani, sets forth a method for "the transformation of the reformed mesophase pitch into carbon fibers", which method includes the steps of:

"heating the reformed...; spinning a carbonaceous fiber...; exposing the spun fiber...so that the spun fiber is rendered infusible; and *heat-treating the infusible fiber over about 800 °C* in an inert atmosphere." (Emphasis added)

Thereafter, the next sentence beginning at line 63, discusses the method of heat treating the infusible fiber. Lines 55-63 clearly *require* achieving a temperature over 800°C in order to produced the carbonized fiber.

In further support of the forgoing, please see claim 14 of Otani which claim is directed to a method for producing a carbon fiber, and requires "heat-treating the infusible fiber at temperatures above 800°C." Further, Example 1, at col. 7 teaches in paragraph 4, producing infusible fibers, then "The infusible fibers were subsequently heated up to *1000 °C* in an atmosphere of...at a heat-up rate of 5°C/min and maintained at that temperature for 10 min to obtain carbonized fibers having..." (Emphasis added). Example 2, states that "The spun fibers were rendered infusible, carbonized...in the same manner as described in Example 1." Please see col. 8, lines 27-30, of Otani.

In view of the foregoing, Otani *requires* achieving a temperature of *over 800 °C* in order to

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carbonize the fibers to produce anisotropic pitch based carbon fibers. Otani does not suggest that a carbonized fiber can be achieved by heating to a temperature of 800°C or below.

(iii) McCullough:

McCullough teaches a fiber diameter of 2 to 25 μm . McCullough teaches carbonizing a carbonaceous fiber at a temperature of 600 to 700°C. As stated by the Board, and recognized by the Examiner, McCullough does not teach the use of anisotropic pitch-based carbon fibers nor the specific method of preparing these fibers. Accordingly, the Examiner applied Otani.

(iv) The Present Invention:

In view of the following, this rejection is respectfully overcome.

Regarding product claim 1 and claims dependent therefrom, claim 1 requires a fiber diameter of not less than 0.5 μm but less than 1.3 μm . Neither of McCullough nor Otani teach or suggest a fiber diameter of not less than 0.5 μm but less than 1.3 μm , as required by present claim 1.

Rather, McCullough teaches a fiber diameter of 2 to 25 μm . It is submitted that "not less than 0.5 μm but less than 1.3 μm ", is well outside McCullough's disclosed range.

Regarding method claims 55-57 and claims dependent therefrom, none of McCullough and Otani, taken alone or together, teach or suggest the steps of: forming a carbon fiber aggregate and then spraying a thermosetting resin solution to the carbon fibers, as required by present claims 55-57.

McCullough '716 teaches producing a composite composed of a thermosetting resin matrix and carbonaceous fibers, by blending an appropriate weight percent of each fiber component, where the fiber components included carbonaceous fibers and binder fiber (i.e., PEB). Battings were then

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produced and were thermally bonded by passing them through a thermal bonding oven. After thermal bonding, the battings were compressed to form panels. Please see McCullough '761, Example 1, at col. 5, line 53.

McCullough at col.3, lines 49-53 discloses preferred resins are commercial polyesters and include those sold under the trademarks "KODEL" and "DACRON". These products are in fiber form.

McCullough does not teach or suggest the steps of forming a carbon fiber aggregate and then spraying a thermosetting resin solution to the carbon fibers, as required by present claims 55-57.

Rather, as discussed above, McCullough teaches blending carbonaceous fibers with "binder fibers" (i.e., the resin matrix), forming a batting, and thermally bonding the batting by passing it through a thermal bonding oven. McCullough teaches only the use of binder fibers. McCullough does not teach how to form a composite structure using a thermoplastic or thermosetting resin material in a form other than a fiber form.

Otani does not cure the deficiencies of McCullough because Otani also does not teach or suggest the present method steps of forming and spraying.

Further, regarding claim 56, claim 56 requires a carbonizing temperature of not lower than 650°C but lower than 750°C. McCullough does not teach or suggest an anisotropic pitch-based carbon fiber, nor a method of producing such a fiber. Otani does not cure the deficiencies of McCullough because Otani does not teach or suggest the presently claimed temperature range. In fact Otani *requires* a temperature of *over 800 °C* in order to produce carbonized fibers.

Regarding claim 57, claim 57 requires producing spun fibers having an average fiber

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diameter of not less than $0.5\ \mu\text{m}$ but less than $1.3\ \mu\text{m}$. As discussed above regarding claim 1, neither of McCullough nor Otani, taken alone or together, teach or suggest producing a spun fiber having an average fiber diameter of not less than $0.5\ \mu\text{m}$ but less than $1.3\ \mu\text{m}$, as required by present claim 57.

Accordingly, it is submitted that nothing in McCullough and Otani, taken alone or together, renders the claimed invention obvious within the meaning of 35 USC § 103. Thus, the Examiner is respectfully requested to withdraw this rejection.

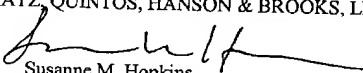
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If, for any reason, it is felt that this application is not now in condition for allowance, the Examiner is requested to contact Applicants undersigned attorney at the telephone number indicated below to arrange for an interview to expedite the disposition of this case.

In the event that this paper is not timely filed, Applicants respectfully petition for an appropriate extension of time. Please charge any fees for such an extension of time and any other fees which may be due with respect to this paper, to Deposit Account No. 01-2340.

Respectfully submitted,

ARMSTRONG, KRATZ, QUINTOS, HANSON & BROOKS, LLP



Susanne M. Hopkins
Attorney for Applicants
Reg. No. 33,247

SMH/plb
Atty. Docket No. 981361
Suite 1000
1725 K Street, N.W.
Washington, D.C. 20006
(202) 659-2930



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